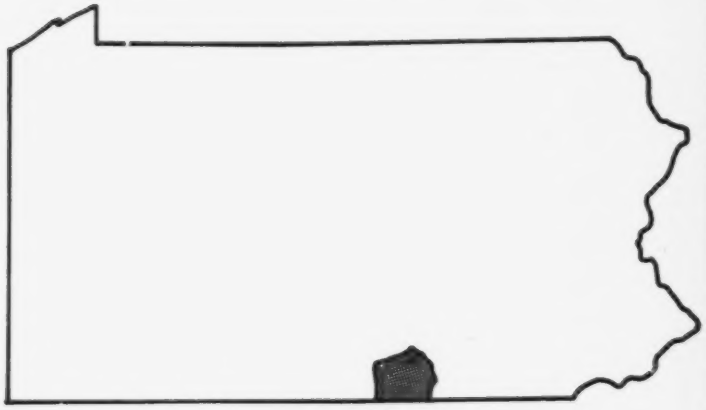
590-C-31
FEMI.209:421239
COMPLETED 32
ORIGINAL

FLOOD INSURANCE STUDY

BOROUGH OF YORK SPRINGS, PENNSYLVANIA
ADAMS COUNTY



MAY 17, 1982

Federal Emergency Management Agency

COMMUNITY NUMBER - 421239

TABLE OF CONTENTS

		Page
1.0	INTRODUCTION	1
	1.1 Purpose of Study	1
	1.2 Authority and Acknowledgements	1
	1.3 Coordination	1
2.0	AREA STUDIED	2
	2.1 Scope of Study	2
	2.2 Community Description	2
	2.3 Principal Flood Problems	4
	2.4 Flood Protection Measures	5
3.0	ENGINEERING METHODS	5
	3.1 Hydrologic Analyses	6
	3.2 Hydraulic Analyses	6
4.0	FLOOD PLAIN MANAGEMENT APPLICATIONS	8
	4.1 Flood Boundaries	8
	4.2 Floodways	8
5.0	INSURANCE APPLICATION	9
	5.1 Reach Determinations	9
	5.2 Flood Hazard Factors	11
	5.3 Flood Insurance Zones	14
	5.4 Flood Insurance Rate Map Description	14

TABLE OF CONTENTS - continued

	Page
6.0 OTHER STUDIES	15
7.0 LOCATION OF DATA	15
8.0 BIBLIOGRAPHY AND REFERENCES	15

FIGURES

Figure 1 - Vicinity Map	3
Figure 2 - Floodway Schematic	11

TABLES

Table 1 - Summary of Discharges	6
Table 2 - Floodway Data	10
Table 3 - Flood Insurance Zone Data	12 - 13

EXHIBITS

Exhibit 1 - Flood Profiles	
Tributary 1	Panel 01P
Tributary 2	Panels 02P-03P
Gardner Run	Panel 04P
Exhibit 2 - Flood Boundary and Floodway Map	

PUBLISHED SEPARATELY:

Flood Insurance Rate Map

FLOOD INSURANCE STUDY
BOROUGH OF YORK SPRINGS, PENNSYLVANIA

1.0 INTRODUCTION

1.1 Purpose of Study

This Flood Insurance Study investigates the existence and severity of flood hazards in the Borough of York Springs, Adams County, Pennsylvania, and aids in the administration of the National Flood Insurance Act of 1968 and the Flood Disaster Protection Act of 1973. This information will allow York Springs to continue participation in the regular program of flood insurance by the Federal Emergency Management Agency (FEMA) with the most current data. Local and regional planners will use this study in their efforts to promote sound flood plain management.

In some states or communities, flood plain management criteria or regulations may exist that are more restrictive or comprehensive than those on which these federally-supported studies are based. These criteria take precedence over the minimum federal criteria for purposes of regulating development in the flood plain, as set forth in the Code of Federal Regulations at 44 CFR, 60.3. In such cases, however, it shall be understood that the state (or other jurisdictional agency) shall be able to explain these requirements and criteria.

1.2 Authority and Acknowledgements

The source of authority for this Flood Insurance Study is the National Flood Insurance Act of 1968 and the Flood Disaster Protection Act of 1973.

The hydrologic and hydraulic analyses for this study were prepared by GEO-Technical Services, Inc., for the Federal Emergency Management Agency, under Contract No. H-4768. This work was completed in February 1981.

1.3 Coordination

On April 20, 1978, an initial Consultation and Coordination Officer's (CCO) meeting was held with representatives of the FEMA, the Borough of York Springs, and GEO-Technical Services, Inc. (the study contractor). Streams requiring detailed study were identified during a field reconnaissance survey by the study contractor and were included in this study on January 8, 1979. A search for basic information was made at all levels of government and in the private sector.

During the course of the study, contact was made with the Susquehanna River Basin Commission, the York Springs Board of Supervisors, the National Weather Service, and the Federal State River Forecasting Center. Flood-frequency information was coordinated with the U. S. Geological Survey (USGS). On December 10, 1981, the results of the study were reviewed at a final CCO meeting attended by representatives of the FEMA, the borough, and study contractor.

2.0 AREA STUDIED

2.1 Scope of Study

This Flood Insurance Study covers the incorporated area of the Borough of York Springs, Adams County, Pennsylvania. The area of study is shown on the Vicinity Map (Figure 1).

The entire length of Tributary 1 within the corporate limits, Tributary 2 from its confluence with Tributary 1 to the upstream corporate limits, and Gardner Run from the downstream corporate limits to a point approximately 200 feet upstream were studied by detailed methods. Shallow flooding on Gardner Run from the upstream limit of detailed study to the upstream corporate limits and on Gardner Run Tributary from 85 feet upstream of its confluence with Gardner Run to the upstream corporate limits was also included in the analyses. The areas studied by detailed methods were selected with priority given to all known flood hazard areas and areas of projected development and proposed construction for the next five years, through February 1986.

2.2 Community Description

The Borough of York Springs is located in the northeastern portion of Adams County in south-central Pennsylvania, approximately 20 miles southwest of the City of Harrisburg. York Springs is bordered by the Township of Latimore to the northeast and the Township of Huntington on all other sides. The total land area contained within the borough limits is 0.1 square mile (Reference 1). According to U. S. Bureau of the Census estimates, the population of York Springs increased from 467 in 1970 to 497 in 1976 (References 2 and 3).

Tributary 1 enters the northern portion of the borough from the north and flows southeast into the Township of Latimore to its confluence with Latimore Creek. Prior to leaving the borough, Tributary 1 is joined by Tributary 2 from the west. The drainage area of Tributary 1 at the downstream corporate limits is 0.832 square mile and 0.613 square mile at the upstream corporate limits. The drainage area of Tributary 2 at its confluence with Tributary 1 is 0.214 square mile (Reference 4).

BEST DOCUMENT AVAILABLE

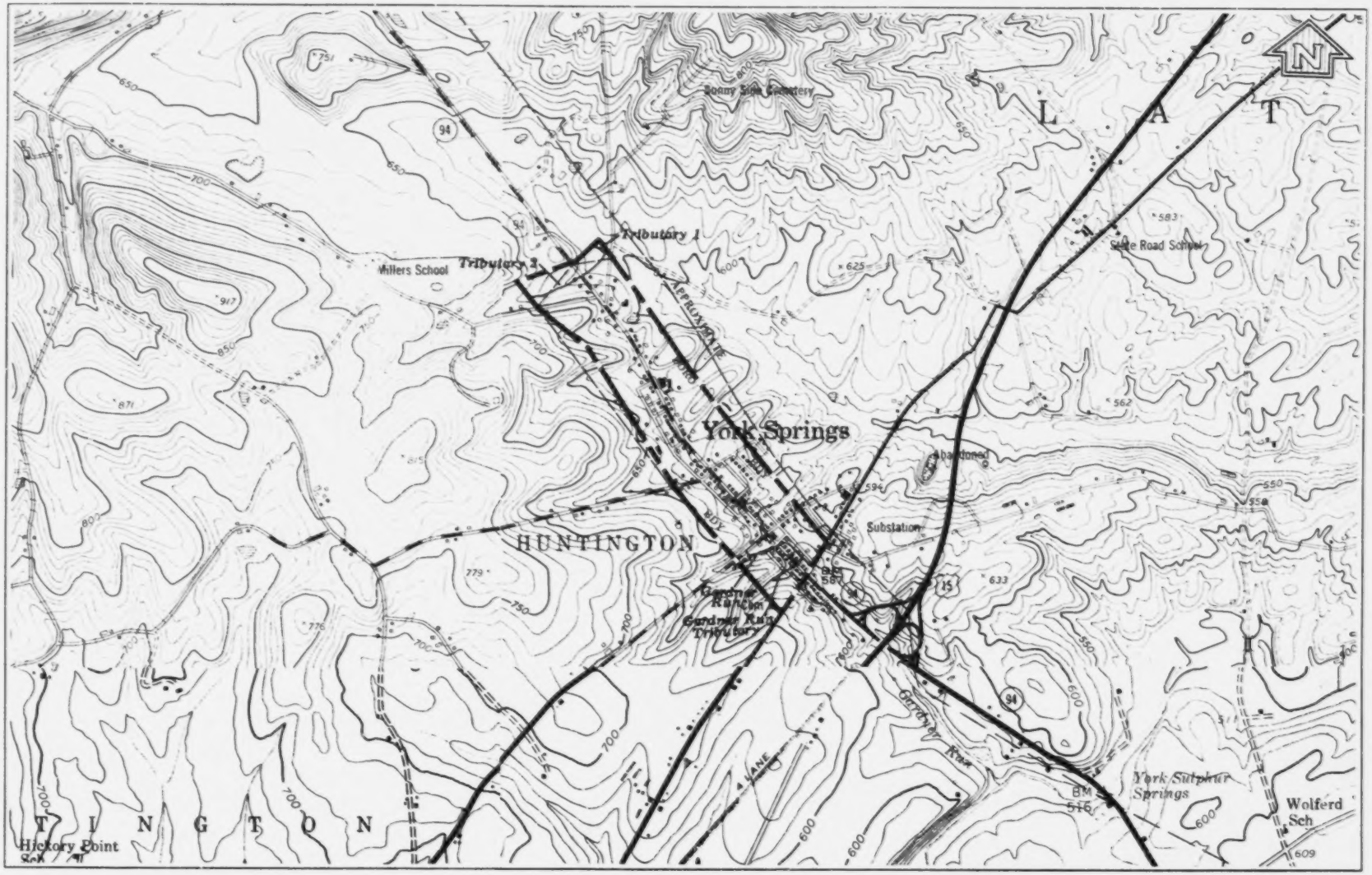


FIGURE 1

FEDERAL EMERGENCY MANAGEMENT AGENCY

BOROUGH OF YORK SPRINGS, PA
(ADAMS CO,)

APPROXIMATE SCALE

2000 0 2000 4000 6000 FEET

VICINITY MAP

Gardner Run enters the southeastern portion of the borough from the Township of Huntington and flows northeast under Main Street. After being joined by Tributary to Gardner Run, it flows under U. S. Route 15 and into Huntington again. The drainage area of Gardner Run at U. S. Route 15 is 0.279 square mile and 0.175 at the upstream corporate limits. The drainage area of Tributary to Gardner Run at its confluence with Gardner Run is 0.780 square mile.

The major land use in York Springs is predominately residential. Within the flood plains of the detailed study streams, development consists of single-family residences and small local support businesses.

The climate of the borough is continental and is modified by the effects of the Atlantic Ocean and the Gulf of Mexico. During the period of the study, summer and winter mean temperature extremes were 96 degrees Fahrenheit (°F) and -40°F, respectively. The average annual precipitation is 39.3 inches, of which the mean annual runoff is the equivalent of 15.7 inches (References 5 and 6).

2.3 Principal Flood Problems

The past history of flooding on the streams within York Springs indicates that floods may occur during any season of the year. Major floods have occurred during the late summer and fall and were associated with tropical storms moving up the Atlantic coastline.

On January 25, 1979, a combination of drastic temperature changes and rainfall, over antecedent accumulation of snow, caused significant runoff and resulted in overbank flow of the study area streams. A similar occurrence in February 1978 caused flooding in the borough.

The USGS maintains a stream gaging station at the mouth of West Conewago Creek, which is downstream of the borough. Flow records, available since 1928, reflect the total flow of the creek and its tributaries.

There have been a number of major floods on West Conewago Creek in this century. The three worst floods occurred in September 1975, June 1972, and August 1933. The discharges associated with these events at the gaging station were 96,200 cubic feet per second (cfs), 81,700 cfs, and 47,600 cfs, respectively. The estimated recurrence intervals were 500 years, 250 years, and 50 years, respectively. Floodmarks for the study area streams were located by survey for the floods of 1975 and 1978.

The estimated discharge for Tributary 1 at the downstream corporate limits is 980 cfs. No high-water marks are known to exist for Tributary 1 or Tributary 2 within the study area.

The estimated 100-year discharge for Gardner Run at U. S. Route 15 in the borough is 500 cfs. Discharges on Gardner Run and Tributary to Gardner Run are indefinable at Main Street and west of Main Street. Numerous culverts of varying size, when full, force flows out of the channel in these areas and produce shallow flooding conditions.

Several high-water marks were recorded in York Springs during the 1975 flood. The flood corresponded to the 100-year flood in the Gardner Run area. The 1975 flood elevation at private property adjacent to Gardner Run at the intersection of U. S. Route 15 and Main Street was approximately 587 feet.

2.4 Flood Protection Measures

There are no existing or proposed flood control measures within the Borough of York Springs. Non-structural measures of flood protection are being utilized to aid in the prevention of future flood damage. These are in the form of land-use regulations adopted from the Code of Federal Regulations, which control building within areas that have a high risk of flooding. Borough supervisors have adopted flood plain management regulations in compliance with Section 1910.3 (b) of the Federal Regulations.

3.0 ENGINEERING METHODS

For the flooding sources studied in detail in the community, standard hydrologic and hydraulic study methods were used to determine the flood hazard data for this study. Flood events of a magnitude which are expected to be equalled or exceeded once on the average during any 10-, 50-, 100-, or 500-year period (recurrence interval) have been selected as having special significance for flood plain management and for flood insurance premium rates. These events, commonly termed the 10-, 50-, 100-, and 500-year floods, have a 10-, 2-, 1-, and 0.2-percent chance, respectively, of being equalled or exceeded during any year. Although the recurrence interval represents the long-term average period between floods of a specific magnitude, rare floods could occur at short intervals or even within the same year. The risk of experiencing a rare flood increases when periods greater than one year are considered. For example, the risk of having a flood which equals or exceeds the 100-year flood (one-percent chance of annual occurrence) in any 50-year period is about 40 percent (four in ten) and, for any 90-year period, the risk increases to about 60 percent (six in ten). The analyses reported here reflect flooding potentials based on conditions existing in the community at the time of completion of this study. Maps and flood elevations will be amended periodically to reflect future changes.

3.1 Hydrologic Analyses

Hydrologic analyses were carried out to establish the peak discharge-frequency relationships for floods of the selected recurrence intervals for each flooding source studied in detail affecting the community.

For Tributary 1, Tributary 2, and Gardner Run, flood magnitudes were determined by the relationship between selected precipitation events and the resulting surface runoff from the small sub-watersheds. The effective storm period that contributes to instantaneous peak rates of runoff varies with the time of runoff travel to the selected stream locations in the community (time of concentration). Peak discharges were determined by the summation of triangular unit hydrographs for the applicable time of concentration and by employing the Soil Conservation Service (SCS) technique of rainfall distribution for selected storm events (References 7 and 8). Rainfall frequencies and magnitudes were determined by procedures developed by Reich, et al. (Reference 9).

A summary of drainage area-peak discharge relationships for the streams studied by detailed methods is shown in Table 1, "Summary of Discharges".

TABLE 1 - SUMMARY OF DISCHARGES

FLOODING SOURCE AND LOCATION	DRAINAGE AREA (sq. miles)	PEAK DISCHARGES (cfs) 10-YEAR	50-YEAR	100-YEAR	500-YEAR
TRIBUTARY 1					
At the downstream corporate limits	0.832	490	840	980	1,320
TRIBUTARY 2					
At the confluence with Tributary 2	0.214	250	448	538	755
GARDNER RUN					
At the downstream corporate limits	0.279	294	430	500	650
200 feet upstream of the corporate limits	0.175	200	300	350	450

3.2 Hydraulic Analyses

Analyses of the hydraulic characteristics of the flooding sources studied in detail were carried out to provide estimates of the elevations of floods of the selected recurrence intervals along each of these flooding sources.

Water-surface elevations of floods of the selected recurrence intervals were computed through the use of the U. S. Army Corps of Engineers (COE) HEC-2 step-backwater computer program (Reference 10). Starting water-surface elevations for Tributary 1, Tributary 2, and Gardner Run were determined using the slope/area method. The estimated main stream flows corresponding to the time of peak flow at the mouths of the various tributaries were computed by means of a dimensionless hydrograph relationship prepared by the SCS (Reference 8). Continuous profiles were then computed from the starting points to the termination points of the detailed study streams. Water-surface elevations upstream of the bridges and culverts were computed by combined orifice and applicable weir flow through and above the structures, respectively.

Cross sections of the flood plains were obtained from aerial photographs flown in November 1978 at a scale of 1"=800' (Reference 11). Stream cross sections were obtained by field survey. All bridges and culverts were field checked to obtain elevation data and structural geometry.

Channel roughness factors (Manning's "n") used in the hydraulic computations were determined by engineering judgment based on field observations of the stream and flood plain conditions. The selected "n" values were within the range of tables derived by Ven Te Chow (Reference 12). The channel "n" value for Tributary 1 was 0.039, and the overbank "n" value was 0.065. The channel "n" values for Tributary 2 ranged from 0.025 to 0.039, and the overbank "n" values ranged from 0.057 to 0.065. The channel "n" values for Gardner Run ranged from 0.025 to 0.038, and the overbank "n" values ranged from 0.060 to 0.080. The tabulated roughness values apply to all floods within the cited recurrence intervals. Initial computer runs were made to duplicate historic flood profiles for which high-water mark elevations were determined by field survey. When a satisfactory model was achieved, the water-surface profiles were computed for floods having 10-, 50-, 100-, and 500-year recurrence intervals.

Areas of shallow flooding caused by shallow overflow on Gardner Run and Gardner Run Tributary were identified from local citizen reports of recent historic floods. Flood elevations of the 1975 flood were obtained by field survey of high-water marks within York Springs. Depths of flooding for the 100-year frequency flood were determined from a comparison of floodmarks and cross sections within the area. The depth of shallow flooding in York Springs was determined to be 2 feet.

Flood profiles were drawn showing computed water-surface elevations to an accuracy of 0.5 foot for floods of the selected recurrence intervals. Locations of selected cross sections used in the hydraulic analyses are shown on the Flood Profiles (Exhibit 1). For stream segments for which a floodway is computed (Section 4.2), selected cross-section locations are also shown on the Flood Boundary and Floodway Map (Exhibit 2).

All elevations used in this study are referenced to the National Geodetic Vertical Datum of 1929 (NGVD), formerly referred to as Sea Level Datum of 1929. Locations of the elevation reference marks used in the study are shown on the maps.

The hydraulic analyses for this study are based on the effects of unobstructed flow. The flood elevations shown on the profiles are valid only if hydraulic structures remain unobstructed and do not fail.

4.0 FLOOD PLAIN MANAGEMENT APPLICATIONS

The National Flood Insurance Program encourages state and local governments to adopt sound flood plain management programs. Therefore, each Flood Insurance Study includes a flood boundary map designed to assist communities in developing sound flood plain management measures.

4.1 Flood Boundaries

In order to provide a national standard without regional discrimination, the 100-year flood has been adopted by the FEMA as the base flood for purposes of flood plain management measures. The 500-year flood is employed to indicate additional areas of flood risk in the community. For the streams studied in detail, the boundaries of the 100- and 500-year floods have been delineated using the flood elevations determined at each cross section; between cross sections and for the shallow flooding areas, the boundaries were interpolated using topographic maps at a scale of 1:4,800 with a contour interval of 4 feet (Reference 13). In cases where the 100- and 500-year flood boundaries are close together, only the 100-year boundary has been shown.

The boundaries of the 100- and 500-year floods are shown on the Flood Boundary and Floodway Map (Exhibit 2). Small areas within the flood boundaries may lie above the flood elevations and, therefore, may not be subject to flooding. Owing to limitations of the map scale and lack of detailed topographic data, such areas are not shown.

4.2 Floodways

Encroachment on flood plains, such as artificial fill, reduces the flood-carrying capacity, increases the flood heights of streams, and increases flood hazards in areas beyond the encroachment itself. One aspect of flood plain management involves balancing the economic gain from flood plain development against the resulting increase in flood hazard. For purposes of the Flood Insurance Program, the concept of a floodway is used as a tool to assist local communities in this aspect of flood plain management. Under this concept, the area of the 100-year flood is divided into a floodway and a floodway fringe. The floodway is

the channel of a stream plus any adjacent flood plain areas that must be kept free of encroachment in order that the 100-year flood can be carried without substantial increases in flood heights. Minimum standards of the FEMA limit such increases in flood heights to 1.0 foot, provided that hazardous velocities are not produced. The floodways in this report are presented to local agencies as minimum standards that can be adopted or that can be used as a basis for additional studies.

The floodways presented in this study were computed on the basis of equal conveyance reduction from each side of the flood plains. The results of these computations are tabulated at selected cross sections for each stream segment for which a floodway is computed (Table 2).

As shown on the Flood Boundary and Floodway Map (Exhibit 2), the floodway widths were determined at cross sections; between cross sections, the boundaries were interpolated. In cases where the boundaries of the floodway and the 100-year flood are either close together or collinear, only the floodway boundary has been shown.

The area between the floodway and the boundary of the 100-year flood is termed the floodway fringe. The floodway fringe thus encompasses the portion of the flood plain that could be completely obstructed without increasing the water-surface elevation of the 100-year flood by more than 1.0 foot at any point. Typical relationships between the floodway and the floodway fringe and their significance to flood plain development are shown in Figure 2.

5.0 INSURANCE APPLICATION

In order to establish actuarial insurance rates, the FEMA has developed a process to transform the data from the engineering study into flood insurance criteria. This process includes the determination of reaches, Flood Hazard Factors (FHFs), and flood insurance zone designations for each flooding source affecting the Borough of York Springs.

5.1 Reach Determinations

Reaches are defined as lengths of watercourses having relatively the same flood hazard, based on the average weighted difference in water-surface elevations between the 10- and 100-year floods. This difference does not have a variation greater than that indicated in the following table for more than 20 percent of the reach.

Blank

Page

FLOODING SOURCE		FLOODWAY			BASE FLOOD WATER SURFACE ELEVATION			
CROSS SECTION	DISTANCE	WIDTH (FT.)	SECTION AREA (SQ. FT.)	MEAN VELOCITY (F.P.S.)	REGULATORY (NGVD)	WITHOUT FLOODWAY (NGVD)	WITH FLOODWAY (NGVD)	INCREASE (FEET)
Tributary 1								
A	5,960[1]	80	341	2.9	605.7	605.7	606.6	0.9
Tributary 2								
A	425[2]	45	134	4.0	614.0	614.0	615.0	1.0
B	530[2]	50	202	2.7	619.4	619.4	620.1	0.7
C	815[2]	47	81	6.6	622.2	622.2	622.2	0.0
D	1,250[2]	54	96	5.6	635.3	635.3	635.3	0.0
Gardner Run								
A	13[3]	8	60	8.3	586.2	586.2	587.2	1.0
B	220[3]	13	45	7.7	587.9	587.9	588.8	0.9

[1]Feet above U. S. Route 15
[2]Feet above confluence with Tributary 1
[3]Feet above corporate limits

TABLE 2

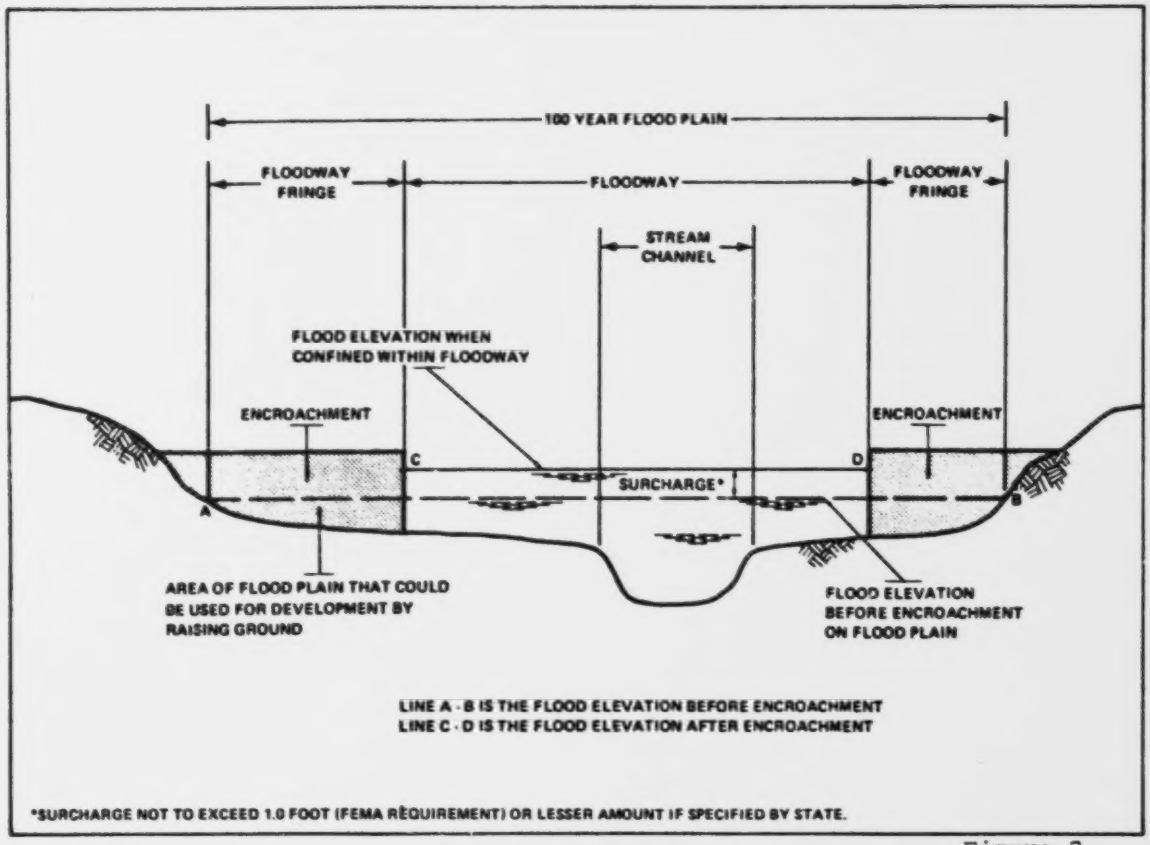
FEDERAL EMERGENCY MANAGEMENT AGENCY

BOROUGH OF YORK SPRINGS, PA
(ADAMS CO.)

FLOODWAY DATA

TRIBUTARY 1, TRIBUTARY 2 AND GARDNER RUN

BEST DOCUMENT AVAILABLE


100 YEAR FLOOD PLAIN
FLOODWAY FRINGE
FLOODWAY
FLOODWAY FRINGE
STREAM CHANNEL
FLOOD ELEVATION WHEN CONFINED WITHIN FLOODWAY
ENCROACHMENT
ENCROACHMENT
C
D
SURCHARGE*
A
B
AREA OF FLOOD PLAIN THAT COULD BE USED FOR DEVELOPMENT BY RAISING GROUND
FLOOD ELEVATION BEFORE ENCROACHMENT ON FLOOD PLAIN
LINE A - B IS THE FLOOD ELEVATION BEFORE ENCROACHMENT
LINE C - D IS THE FLOOD ELEVATION AFTER ENCROACHMENT
*SURCHARGE NOT TO EXCEED 1.0 FOOT (FEMA REQUIREMENT) OR LESSER AMOUNT IF SPECIFIED BY STATE.

FLOODWAY SCHEMATIC

Figure 2

Average Difference Between 10- and 100-Year Floods	Variation
Less than 2 feet	0.5 foot
2 to 7 feet	1.0 foot
7.1 to 12 feet	2.0 feet
More than 12 feet	3.0 feet

The locations of the reaches determined for the flooding sources of the Borough of York Springs are shown on the Flood Profiles (Exhibit 1) and are summarized in the Flood Insurance Zone Data Table (Table 3).

5.2 Flood Hazard Factors

The FHF is the FEMA device used to correlate flood information with insurance rate tables. Correlations between property damage from floods and their FHFs are used to set actuarial insurance premium rate tables based on FHFs from 005 to 200.

BEST DOCUMENT AVAILABLE

BEST DOCUMENT AVAILABLE

FLOODING SOURCE	PANEL[1]	ELEVATION DIFFERENCE[2] BETWEEN 1.0% (100-YEAR) FLOOD AND			FHF	ZONE	BASE FLOOD ELEVATION[3] (NGVD)
		10% (10 YR.)	2% (50 YR.)	0.2% (500 YR.)			
Tributary 1 Reach 1	01	-0.9	-0.2	+0.6	010	A2	Varies
Tributary 2 Reach 1	01	-0.8	-0.2	+0.4	010	A2	Varies
Gardner Run Reach 1	01	-2.0	-0.7	+2.1	020	A4	Varies
Gardner Run From 220 feet upstream of corporate limits to the upstream corporate limits	01	Shallow Flooding - Average Depth 2 Feet				AO	--

[1]Flood Insurance Rate Map Panel
[2]Weighted Average
[3]Rounded to the nearest foot - see map

TABLE 3

FEDERAL EMERGENCY MANAGEMENT AGENCY

BOROUGH OF YORK SPRINGS, PA
(ADAMS CO.)

FLOOD INSURANCE ZONE DATA

TRIBUTARY 1, TRIBUTARY 2 AND GARDNER RUN

BEST DOCUMENT AVAILABLE

FLOODING SOURCE	PANEL[1]	ELEVATION DIFFERENCE[2] BETWEEN 1.0% (100-YEAR) FLOOD AND			FHF	ZONE	BASE FLOOD ELEVATION[3] (NGVD)
		10% (10 YR.)	2% (50 YR.)	0.2% (500 YR.)			
Gardner Run Tributary 85 feet upstream of confluence to corporate limits	01	Shallow Flooding - Average Depth			2 Feet	AO	--

[1]Flood Insurance Rate Map Panel
[2]Weighted Average
[3]Rounded to the nearest foot - see map

TABLE 3

FEDERAL EMERGENCY MANAGEMENT AGENCY

BOROUGH OF YORK SPRINGS, PA
(ADAMS CO.)

FLOOD INSURANCE ZONE DATA

GARDNER RUN TRIBUTARY

The FHF for a reach is the average weighted difference between the 10- and 100-year flood water-surface elevations expressed to the nearest 0.5 foot, and shown as a three-digit code. For example, if the difference between water-surface elevations of the 10- and 100-year floods is 0.7 foot, the FHF is 005; if the difference is 1.4 feet, the FHF is 015; if the difference is 5.0 feet, the FHF is 050. When the difference between the 10- and 100-year water-surface elevations is greater than 10.0 feet, accuracy for the FHF is to the nearest foot.

5.3 Flood Insurance Zones

After the determination of reaches and their respective FHFs, the entire incorporated area of the Borough of York Springs was divided into zones, each having a specific flood potential or hazard. Each zone was assigned one of the following flood insurance zone designations:

Zone A0: Special Flood Hazard Areas inundated by types of 100-year shallow flooding where depths are between 1.0 and 3.0 feet; depths are shown, but no FHFs are determined.

Zones A2 and A4: Special Flood Hazard Areas inundated by the 100-year flood, determined by detailed methods; base flood elevations shown, and zones subdivided according to FHF.

Zone B: Areas between the Special Flood Hazard Area and the limits of the 500-year flood, including areas of the 500-year flood plain that are protected from the 100-year flood by dike, levee, or other water control structure; also, areas subject to certain types of 100-year shallow flooding where depths are less than 1.0 foot; and areas subject to 100-year flooding from sources with drainage areas less than 1 square mile. Zone B is not subdivided.

Zone C: Areas of minimal flooding.

Table 3, "Flood Insurance Zone Data," summarizes the flood elevation differences, FHFs, flood insurance zones, and base flood elevations for the flooding sources studied in detail in the Borough of York Springs.

5.4 Flood Insurance Rate Map Description

The Flood Insurance Rate Map for the Borough of York Springs is, for insurance purposes, the principal result of the Flood Insurance Study. This map (published separately) contains the official delineation of flood insurance zones and base flood elevation lines. Base flood ele-

vation lines show the locations of the expected whole-foot water-surface elevations of the base (100-year) flood. This map is developed in accordance with the latest flood insurance map preparation guidelines published by the FEMA.

6.0 OTHER STUDIES

A Flood Insurance Study for the Township of Latimore is currently being prepared (Reference 14). The results of that study will be in exact agreement with the results of this study.

This study is authoritative for purposes of the Flood Insurance Program, and the data presented here either supersede or are compatible with previous determinations.

7.0 LOCATION OF DATA

Survey, hydrologic, hydraulic, and other pertinent data used in this study can be obtained by contacting the office of the Insurance and Mitigation Division of the Federal Emergency Management Agency, Regional Director, Region III Office, Curtis Building, Room 700, Sixth and Walnut Streets, Philadelphia, Pennsylvania 19106.

8.0 BIBLIOGRAPHY AND REFERENCES

1. U. S. Department of Commerce, Bureau of the Census, Area Measurement Reports, Areas of Pennsylvania, Washington, D. C., U. S. Government Printing Office, 1960.

2. U. S. Department of Commerce, Bureau of the Census, 1970 Census of Population, Number of Inhabitants, Pennsylvania, Washington, D. C., U. S. Government Printing Office, 1971.

3. U. S. Department of Commerce, Bureau of the Census, Population Estimates for Federal General Revenue Sharing Program, Washington, D. C., U. S. Government Printing Office, July 1, 1976.

4. Commonwealth of Pennsylvania, Department of Environmental Resources, Pennsylvania Gazetteer of Streams, Part I by L. C. Shaw and W. F. Busch, Harrisburg, Pennsylvania, 1971.

5. U. S. Department of Commerce, National Oceanic and Atmospheric Administration, Climatological Data for Pennsylvania, Annual Summary for 1978, Asheville, North Carolina, National Climatic Center, 1979.

6. U. S. Department of the Interior, Geological Survey, Water Resources Data for Pennsylvania, Water Data Reports, Harrisburg, Pennsylvania, Published Annually 1961-1978.

7. U. S. Department of Agriculture, Soil Conservation Service, Technical Paper 149, A Method for Estimating Volume and Rate of Runoff in Small Watersheds, Washington, D. C., Revised April 1973.

8. U. S. Department of Agriculture, Soil Conservation Service, National Engineering Handbook, Section 4, Hydrology, Washington, D. C., August 1972.

9. The Pennsylvania State University, Institute for Research on Land and Water Resources, Publication No. 65, Design Procedures for Rainfall Duration Frequency in Pennsylvania by B. M. Reich, D. F. McGinnis, and R. L. Kerr, University Park, Pennsylvania, August 1970.

10. U. S. Army Corps of Engineers, Hydrologic Engineering Center, HEC-2 Water Surface Profiles, Generalized Computer Program, Davis, California, November 1976, Updated August 1979.

11. Pace Aerial Surveys of York, Pennsylvania, Aerial Photographs, Scale 1:4,800: Tributary 1, Tributary 2, Gardner Run, Borough of York Springs, Adams County, Pennsylvania, November 1978.

12. Ven Te Chow, Open-Channel Hydraulics, New York, McGraw-Hill, 1959.

13. Pace Aerial Surveys of York, Pennsylvania, Topographic Maps compiled from aerial photographs, Scale 1:4,800, Contour Interval 4 Feet: Tributary 1, Tributary 2, Gardner Run, Borough of York Springs, Adams County, Pennsylvania, November 1978.

14. Federal Emergency Management Agency, Federal Insurance Administration, Flood Insurance Study, Township of Latimore, Adams County, Pennsylvania (Unpublished).

GEO-Technical Services, Inc., prepared for the Susquehanna River Basin Commission, Adams County Water Resources, 1976.

U. S. Army Corps of Engineers, New York District, Hydrologic Study, Tropical Storm Agnes, New York, December 1975.

U. S. Department of the Interior, Geological Survey, 7.5-Minute Series Topographic Maps, Scale 1:24,000, Contour Interval 20 Feet: Dillsburg, Pennsylvania, 1952, Photorevised 1968 and 1973; Mount Holly Springs, Pennsylvania, 1952, Photorevised 1968 and 1973; Hampden, Pennsylvania, 1944, Photorevised 1968.

FLOOD PROFILES

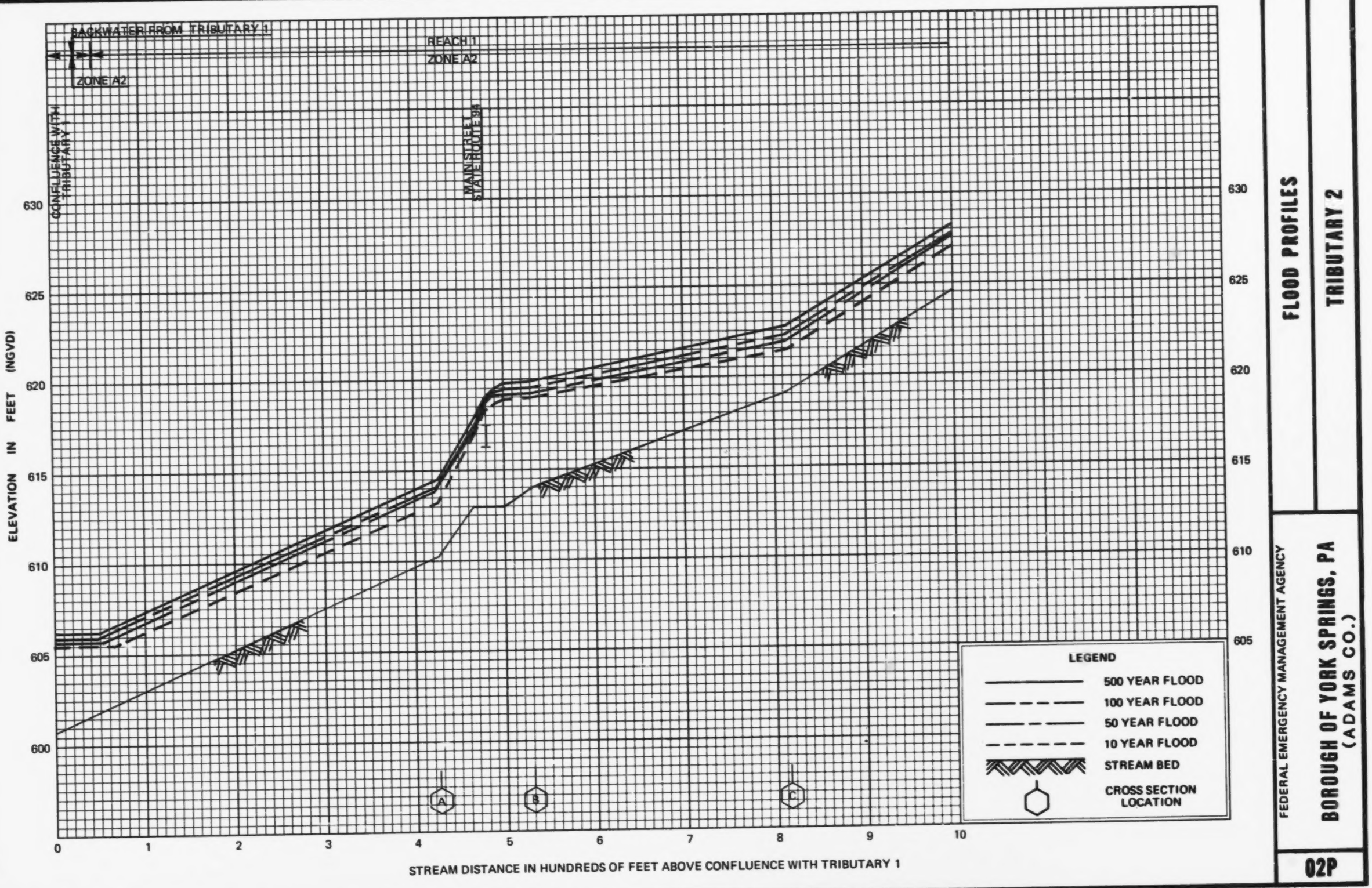
TRIBUTARY 1

FEDERAL EMERGENCY MANAGEMENT AGENCY

BOROUGH OF YORK SPRINGS, PA
(ADAMS CO.)

01P

BEST DOCUMENT AVAILABLE



FLOOD PROFILES

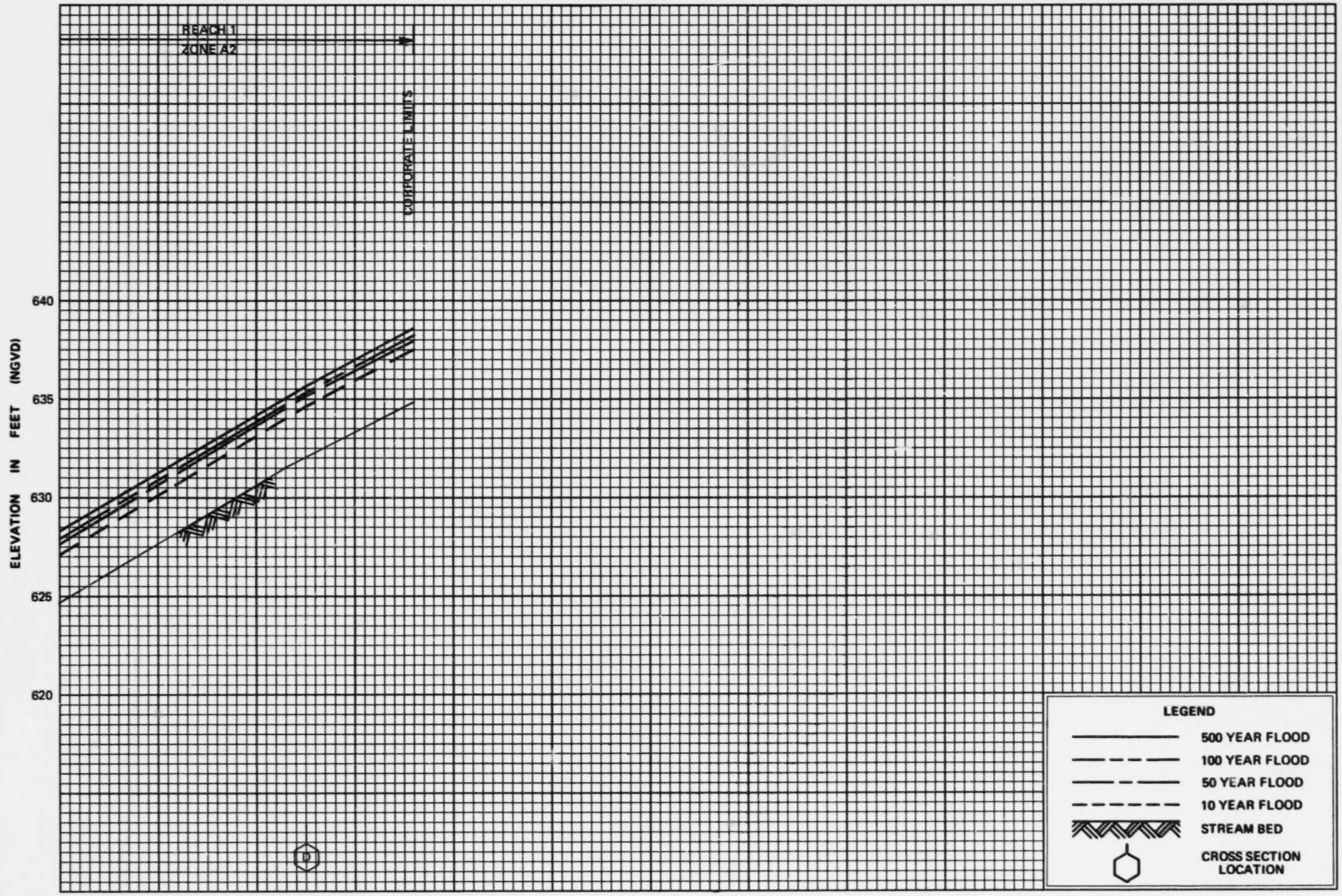
TRIBUTARY 2

FEDERAL EMERGENCY MANAGEMENT AGENCY

BOROUGH OF YORK SPRINGS, PA
(ADAMS CO.)

02P

BEST DOCUMENT AVAILABLE



FLOOD PROFILES

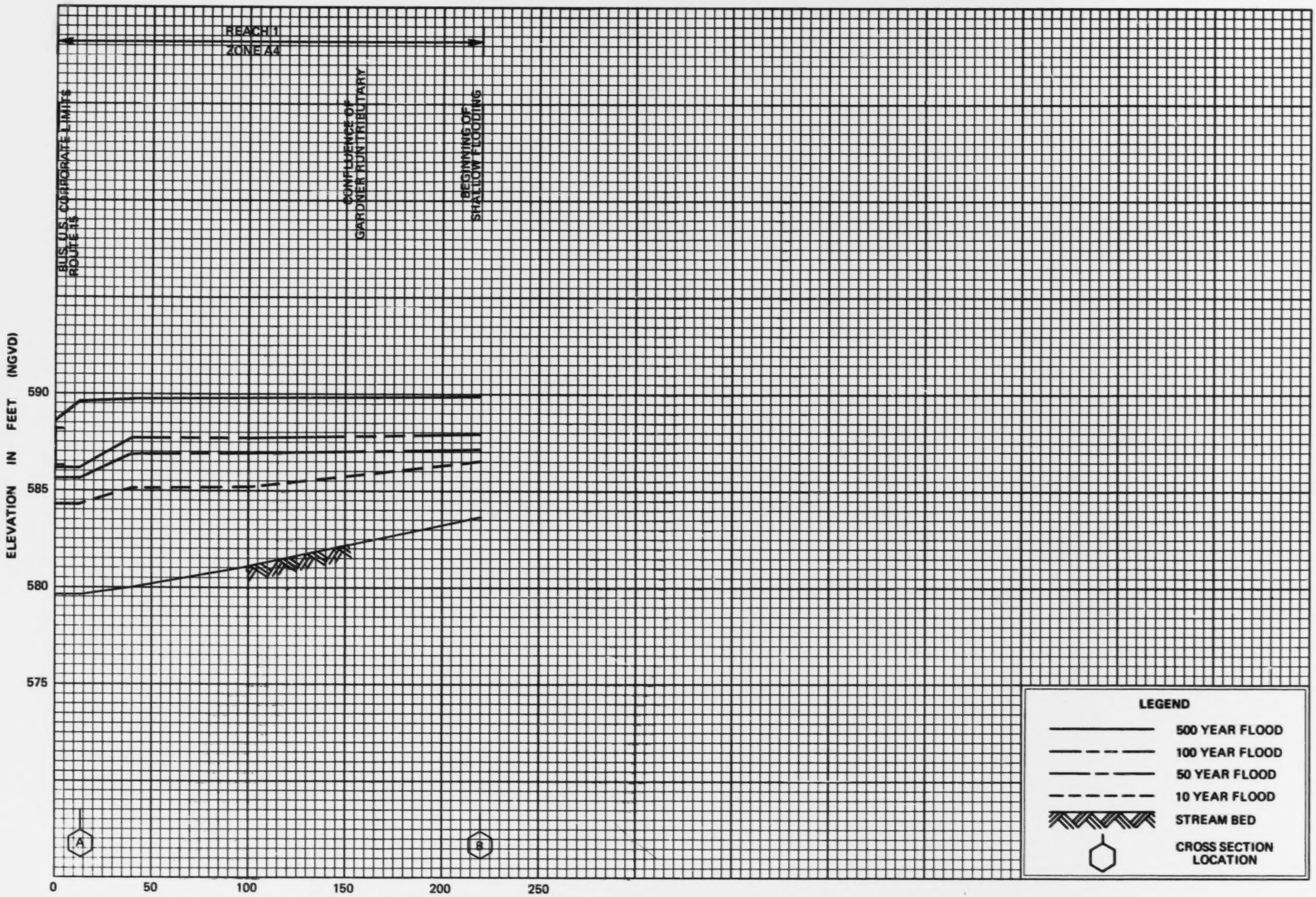
TRIBUTARY 2

FEDERAL EMERGENCY MANAGEMENT AGENCY

BOROUGH OF YORK SPRINGS, PA
(ADAMS CO.)

03P

BEST DOCUMENT AVAILABLE



FLOOD PROFILES

GARDNER RUN

FEDERAL EMERGENCY MANAGEMENT AGENCY

BOROUGH OF YORK SPRINGS, PA
(ADAMS CO.)

04P

BEST DOCUMENT AVAILABLE